Institute on November 29. In the course of his address Mr. Sulman pointed out that the dominant thought which impressed one to-day was the many-sidedness, the increasing scope, and the intense vigour which now marks metallurgical progress. The interaction of associated sciences is now beginning to play its part in the development of metallurgical industries. Certain of the factors of so-called molecular energy find expression in some of the newer processes and phenomena of metallurgy, as shown in the methods adopted to the harnessing of molecular attractions which reside upon the surfaces of solids, to the purposes of ore concentration. These methods, which have, for example, completely changed the economic outlook of the great Broken Hill deposits of silver-lead-zinc ores, are there used to separate the blends constituent in saleable form from the "tailings" left behind after the bulk of the lead and silver have been recovered. But they are applicable, in general, to all sulphide ores, as well as to finely divided metals and non-metals, such as gold, graphite, carbon, diamond, sulphur, and so on; and they are frequently spoken of as "oil processes," from the fact that in several of them oil is used in larger or smaller quantities, usually in smaller. In such processes there are no chemical reactions to speak of; physical forces of previously unsuspected range and power, so far as commercial applications are concerned, have been induced to do the work more easily and much more economically, the force mainly concerned being what is called "surface energy." Equally new, and probably of great importance to the metallurgist of the future, are the developments in colloidal chemistry. The plasticity of clays and "ultrasliminess" of "slimes" are due to this class of bodies, in which inorganic materials ape the reactions of organic; a clay colloid may almost be said to masquerade as a fatty acid. Mr. Sulman also referred to the extended application of improved magnetic and electrostatic methods for the separation of dry ores, and to catalytic processes of metallurgical importance.

A selected "List of Educational Books for Schools, Colleges, and Self-tuition," issued by Messrs. W. and G. Foyle, 135 Charing Cross Road, London, W.C., has reached us. Nearly all the books included in the catalogue can be supplied secondhand at half the published prices; and Messrs. Foyle will send any book in stock on approval.

Messrs. William Wesley and Son, 28 Essex Street, London, W.C., have sent us a copy of the latest issue of their "Natural History and Scientific Book Circular." It contains a catalogue of 356 selected books on natural history, with coloured illustrations, followed by a list of works published by, or on sale with, Messrs. Wesley and Son, who are, it may be added, agents for the Smithsonian Institution and the U.S. Government departments.

Messrs. J. Wheldon and Co. (38 Great Queen Street, Kingsway, W.C.) have just issued a supplement to their scientific and geological catalogues. The supplement comprises recent purchases in astronomy, chemistry, geology, palæontology, mineralogy, mining, &c., and includes a small collection of works on applied chemistry, metallurgy, and other subjects.

Erratum.—We are asked to state that in the abstract of Mr. Hutchinson's paper read before the Mineralogical Society (p. 165) the temperature at which gypsum becomes optically uniaxial should be 95° C., not 25° C. The incorrect value was given in the typewritten report received by us, and the error was not corrected in the proof submitted and returned to the printers.

OUR ASTRONOMICAL COLUMN.

Discovery of a New Comet, 1911*h*.—A telegram from Kiel announces the discovery of a new comet by M. Schaumasse, at Nice, on November 30. Its position at 17h. 15·9m. (Nice M.T.) was

R.A. = 13h. 12·2m., dec. = 5° 51′ N.,

and its daily motion was found to be +3m. 32s. in R.A. and −13′ in declination; the magnitude is 12·0.

A second telegram gives an observation by Dr. Abetti at Arcetri on December 2, the position at 17h. 26·9m. (Arcetri M.T.) being

R.A. = 13h. 19m. 17·6s., dec. = 5° 24′ 29″ N.

The comet is thus seen to be moving in a south-east direction through Virgo.

Borrelly's Comet, 1911*e*.—Borelly's comet, rediscovered by Mr. Knox Shaw on September 19, is approaching both the sun and the earth. As the perihelion passage will take place on December 18, when the comet is nearly in opposition with the sun, and as the comet is moving northwards rapidly, it may become visible with opera-glasses during the latter part of December and in January, 1912 (*L'Astronomie*, November).

The Production of Star Streams.—A paper by Prof. Benjamin Boss, in No. 629 of *The Astronomical Journal*, discusses, in relation to a star stream he has found among seventy-one large proper-motion stars given in the Preliminary General Catalogue, the somewhat startling suggestion that community of direction and velocity in such streams may be caused by the initiation and maintenance of their motions in an electromagnetic field of universal extent.

The directions and proper motions of eleven of these large proper-motion stars, together with their radial velocities and parallaxes where available, agree so well as to preclude the idea of chance occurrence, and some physical explanation is sought.

Assuming that the stars form from nebulæ, the motion of the latter might explain the phenomena; but the extended nebulæ do not exhibit such *motus peculiaris*, and Prof. Boss seeks the common cause elsewhere.

The suggestion is that the nebulæ are the seat of tremendous ionisation forces producing segregation, and electromagnetic polarities in the segregated masses. In the course of time a relatively strongly polarised mass becomes expelled from the matrix and commences a stellar existence. Initially the directions would be haphazard, but the action of the supposed universally existent electromagnetic field would be to swing the polarised masses into paths along the approximately parallel lines of force. Assuming the B-type stars to be the newest, Prof. Boss finds support in the fact that such stars display random motions, while those in his group of large proper-motion stars, exhibiting community of direction, are of the types F, G, and K. Further, the action of a constant acceleration such as is suggested would tend to level up the differences found in the initial velocities, thus producing the community of velocity observed.

Double-star Measures.—In No. 4534 of the *Astronomische Nachrichten* Prof. Burnham publishes a long list of recent measures of double stars related largely to the proper motion of stellar systems contained in his General Catalogue. The measures were made with the 40-inch refractor at the Yerkes Observatory, and follow on Prof. Burnham's similar publications in the same journal.

In No. 4537 Herr J. Voûte publishes a second list of double-star measures, which will later be published *in extenso* in the Annals of Leyden Observatory.

Radial Velocity of α Cygni.—Some time ago we directed attention to a result obtained by Prof. Belopolsky and Mr. Neuimin in which they found what appeared to be a real difference between the radial velocity of α Cygni as determined from the metallic lines and that determined from the hydrogen and helium lines. At the suggestion of Prof. Frost, Mr. O. J. Lee has examined some measures of the spectrum made by him in 1910, and he fails to find any confirmation of the Pulkowa results. He suggests that the discrepancy found by Neuimin and Belopolsky

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may be due to slight differences of complexity in the hydrogen-line images (*Astrophysical Journal*, vol. xxxiv., No. 4).

THE SPECTRUM OF THE OUTER PLANETS.—In No. 4537 of the *Astronomische Nachrichten* Dr. Otto Büry publishes a note in which he shows that the well-known characteristic absorption-band spectrum of the outer planets can be fairly well matched by combining Chappuis's and Schöne's ozone spectra with the spectrum of the higher oxides of nitrogen obtained by Chappuis. As shown on the plate accompanying the paper, the chief bands in Vogel's spectrum of Uranus, for example, are fairly well represented in the ozone and peroxide spectra; such differences as exist might perhaps become explained if the terrestrial spectra were experimented with more exhaustively under different temperatures and pressures; for Chappuis has shown that the ozone spectrum is sensitive to such changes.

SUN-SPOTS AND CLIMATE.—Considering the climate of Berlin as depicted in the temperature records from 1756 to 1907, and the precipitation records from 1848 to 1907, Herr Otto Meissner finds a possible connection between these climatic features and the periodicity of sun-spots. In a table which he gives in No. 4533 of the *Astronomische Nachrichten* he arranges the years of the eleven-year period from 1 to 11, and opposite each gives the departures of the year's temperature and rainfall from the means. This indicates that the sun-spot maximum years are cold and wet, while the minimum years accord fairly well with the mean. A further investigation considering pressure is to be undertaken.

PROPOSED MEMORIAL TO PROF. P. G. TAIT.

ON Thursday last, November 30, a representative meeting of former students and friends of the late Prof. Tait was held at Edinburgh University, to consider the question of extending the memorials to him. His former colleague, Principal Sir William Turner, K.C.B., presided. About 150 apologies for absence were intimated, amongst these being expressions of approval and support from the Rt. Hon. A. J. Balfour, M.P., the Chancellor of the University; the Right Hon. Lord Aberconway; Sir Archibald Geikie, K.C.B., President of the Royal Society; Sir John Murray, K.C.B., and the Right Hon. Lord Haldane of Cloan, P.C. Lord Haldane wrote:—"I cannot be with you on the 30th, but I wish to say that I am very glad indeed that you are taking the step of raising a memorial fund in connection with Prof. Tait. The publication of his Life affords a suitable occasion for doing this. I shall be glad to be a contributor, for I feel that a record should be preserved of the regard in which his old students and the nation generally held this remarkable man. We have too few figures of the stature of Tait to let them pass away without endeavouring to keep a permanent memorial of their greatness."

As it is now almost a decade since Prof. Tait's death, his successor in the natural philosophy chair (Prof. J. G. MacGregor) made the following statement:—In explanation of the present state of this movement, it may be pointed out that Prof. Tait's main work can be divided into three portions: (1) his educational work, (2) his own experimental researches, and (3) his work in mathematical physics. An appropriate memorial might be raised in connection with any one or more of these. When he entered upon the work of the natural philosophy chair he was deeply impressed by the soundness of Prof. Tait's educational policy, and by the difficulties in the way of applying and extending it; and he suggested as a fitting memorial a fund which would make it possible to carry it out. Without the aid of any appeal, this suggestion led to the receipt of subscriptions to the amount of about 1500*l*. But before action could be taken, it was found that the University itself was organising, and could not defer, a general extension scheme. It was the unanimous opinion of those who had charge of this scheme that it would be unwise to carry on two competing movements at the same time; and the Tait memorial was for this reason made a department of the general extension scheme.

As such it could not be brought to the attention of old students and associates generally, but only to a comparatively small number of them. Nevertheless, additional subscriptions were made to the original fund to the extent of about 500*l*., and a special fund, yielding about 200*l*. per annum, was provided by Sir John Jackson, to be called a Professor Tait's Memorial Fund, and to be used, under the direction of trustees, for research on the lines of Prof. Tait's experimental work.

There are thus memorial funds connected with two of the chief departments of Prof. Tait's activity, but none connected with the third.

The best form for a memorial connected with the professor's work in mathematical physics would obviously be a Tait chair in that subject; and Tait himself advocated the establishment of such a chair. In 1872 he wrote in an article in *Macmillan's Magazine*:—"Would it were not absolutely hoping against hope to proceed as follows. In the Scottish universities, let there be in each a professor of experimental physics and a professor of applied mathematics, in place of the present solitary professor of the enormous subject of natural philosophy."

Many old students have intimated that they would like to have the opportunity of contributing to a memorial. He was satisfied that a very large proportion of them would be found to share this feeling.

It will thus be seen that, as a Tait memorial has been founded, the question before this meeting is, shall we take for ourselves, and arrange to give to the whole body of the professor's students and associates and admirers, the opportunity of contributing towards the memorial, and, by enlarging the original fund, or founding a Tait chair, or in any other way that may be determined, making the memorial more worthy even than it now is of the man whose great work, personal and scientific, it is intended to commemorate?

On the motion of Mr. B. Hall Blyth, seconded by Sir G. M. Paul, a resolution agreeing to the proposal was carried.

A general and an executive committee were then appointed. Information will be willingly furnished by Prof. J. G. MacGregor, Edinburgh.

BIRD-NOTES.

IN the October number of *British Birds* another straggler is added to the British list—this time in the shape of the slender-billed curlew (*Numenius tenuirostris*), a small flock of which was observed towards the end of September, 1910, on Romney Marsh, Kent. Of these, an immature pair were shot on September 21, while an adult male was killed two days later. Two of them were examined in the flesh by Mr. M. J. Nicoll. Although stragglers have occurred in Heligoland, Holland, Belgium, northern France, and Germany, the slender-billed curlew is a native of the Mediterranean countries, whence it travels to Siberia to breed. Approximating in size to the whimbrel, the species is distinguished by its short and slender beak and the pear-shaped dark markings on the flanks. The colouring of the crown is unlike that of the whimbrel, showing black and buff streaks like those of the curlew.

In the same issue Dr. E. Hartert points out that English green woodpeckers differ from the central European representative of the species (*Picus viridis pinetorum*) by the still shorter and more slender beak, and on this character proposes that it should be recognised as a separate race (*P. v. pluvius*). Scandinavia, Russia, and eastern Prussia are the home of the typical race; the Italian form, on account of the beak being slenderer than in English birds, is named *P. v. fronus*, and the Spanish *P. v. sharpei* has long been recognised as distinct.

Most ornithologists, when pointing out the features in the plumage by which young partridges may be distinguished from old ones, content themselves with the statement that the tip of the first flight-feather of the wing is pointed in the former, but rounded in birds which have undergone their second autumnal moult. Dr. Louis Bureau, director of the Nantes Museum, in an article (in French) published in the October *Zoologist*, goes, however, much further than this. After stating that there are ten primary wing-quills, he observes that the tenth of the first plumage is the first to fall, this taking place about the end of the first month; when the replacing quill (second plumage) has attained a

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